Drawing Course by Jonathan Simon, MFA (instructor) and Chad Neuman, PhD (producer)

Background, Terms, and Examples of Linear Perspective

Before we get started drawing with depth and then drawing in linear perspective, we should go over the background of the perspective techniques. We will include some examples and terms to know. Some aspects of drawing in perspective can be confusing or frustrating for students, so showing some more examples should help clarify these concepts.

We can draw and show depth without necessarily using the linear perspective technique, and in this section, you will learn those various techniques. For example, artists can add depth by using scale (different sizes of elements or parts of elements), since the same object will be portrayed as smaller when it's further away from the viewer, and vice versa.

We can also use variable value (lighter or darker areas), lost and found edges (out of focus/soft objects that are farther away vs. closer objects that are in focus/sharp), and overlapping elements to show what is in front of the other. The videos in this section demonstrate these techniques and more ways to show depth.

Artists can also use intuition and observation to draw scenes, but when we use the mathematical process of linear perspective, it helps make sure the perspective is accurate. Using linear perspective helps us produce the illusion of three-dimensional space and form, even though it's on a two-dimensional surface (paper, or whatever the drawing is produced on).

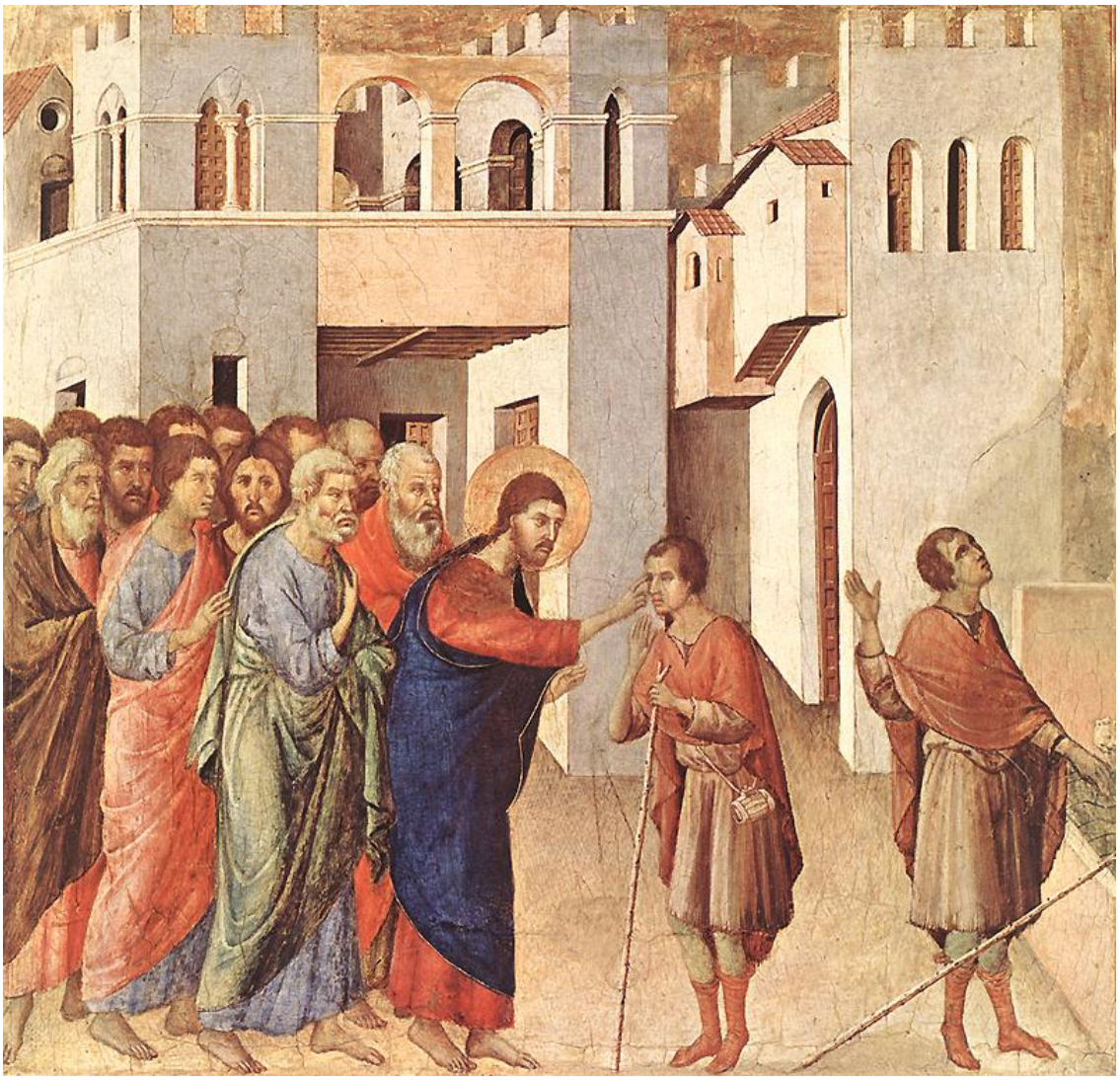
There are plenty of books and helpful resources on the background of linear perspective, so we are not going to delve too much into the history of it, since this is a hands-on, practical class where we apply the techniques. However, briefly reviewing the background of this technique will help illustrate why it's important to know how to draw in perspective and why it's useful.

Drawing in Perspective – A Brief Background

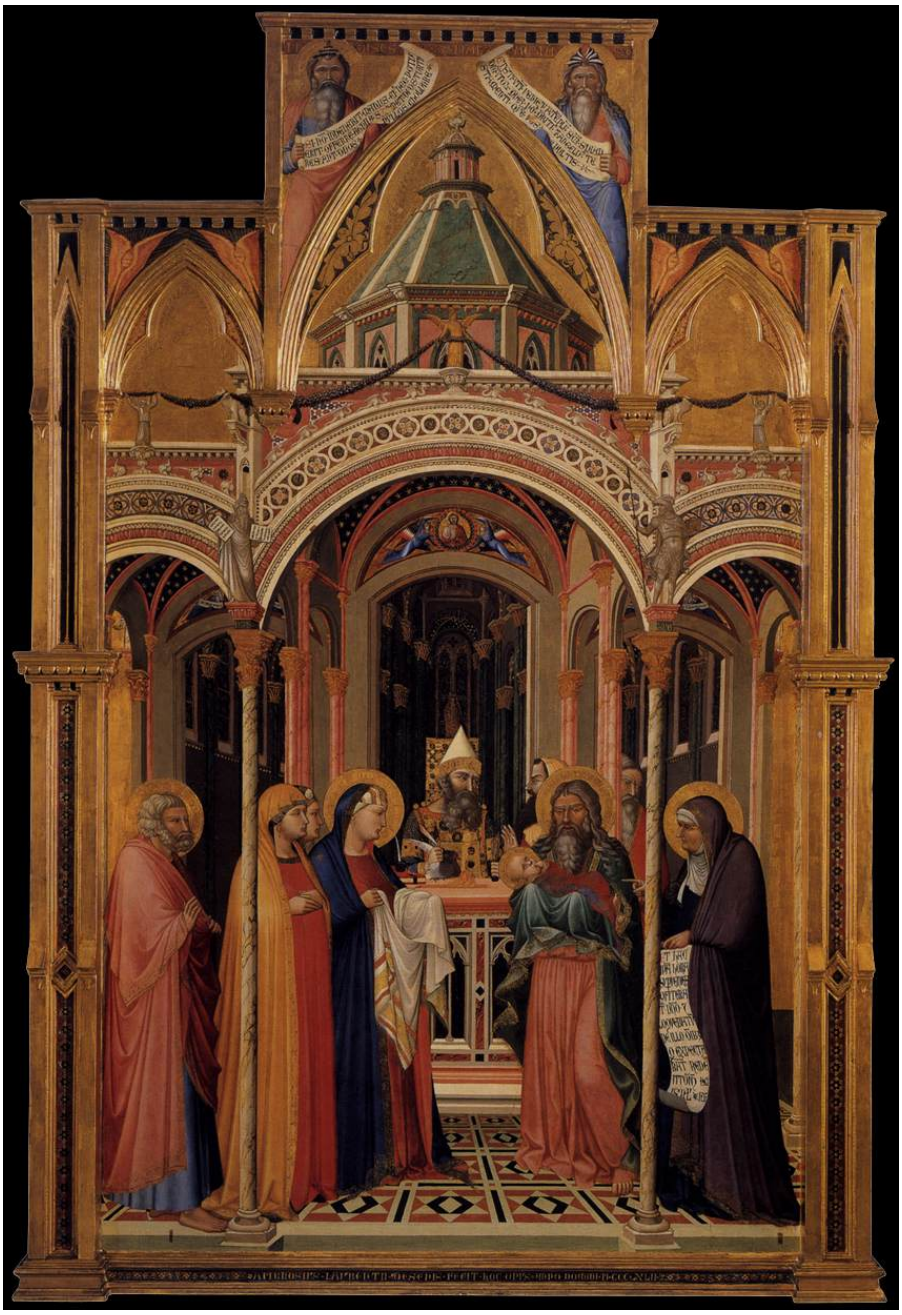
Filippo Brunelleschi, an Italian architect and designer who was born in 1377, discovered one-point perspective (or re-discovered, if it's true that the Ancient Greeks and Romans had known about linear perspective before the Renaissance; this is up for debate among scholars). Brunelleschi was a founding father of Renaissance architecture, and he formulated the mathematics of one-point perspective around 1420. He is known for designing the dome of the Florence Cathedral.

Brunelleschi discovered (or re-discovered) this approach to drawing scenes in perspective, which led to more naturalistic or representational styles in Renaissance art, which was moving away from the more stylized medieval art.

For centuries, artists had been drawing without this method of linear perspective. This would result in drawings and paintings that did not show realistic perspective.



For example, this is “The Healing of the Man Born Blind,” by Duccio, an Italian painter from Siena from the late 13th and early 14th century. Overlapping is used to indicate certain people are behind others, but the composition of the painting does not use linear perspective (particularly the buildings in the background). While it’s an impressive painting by a seminal pre-Renaissance artist, it is an example of art from the Middle Ages that does not use linear perspective.



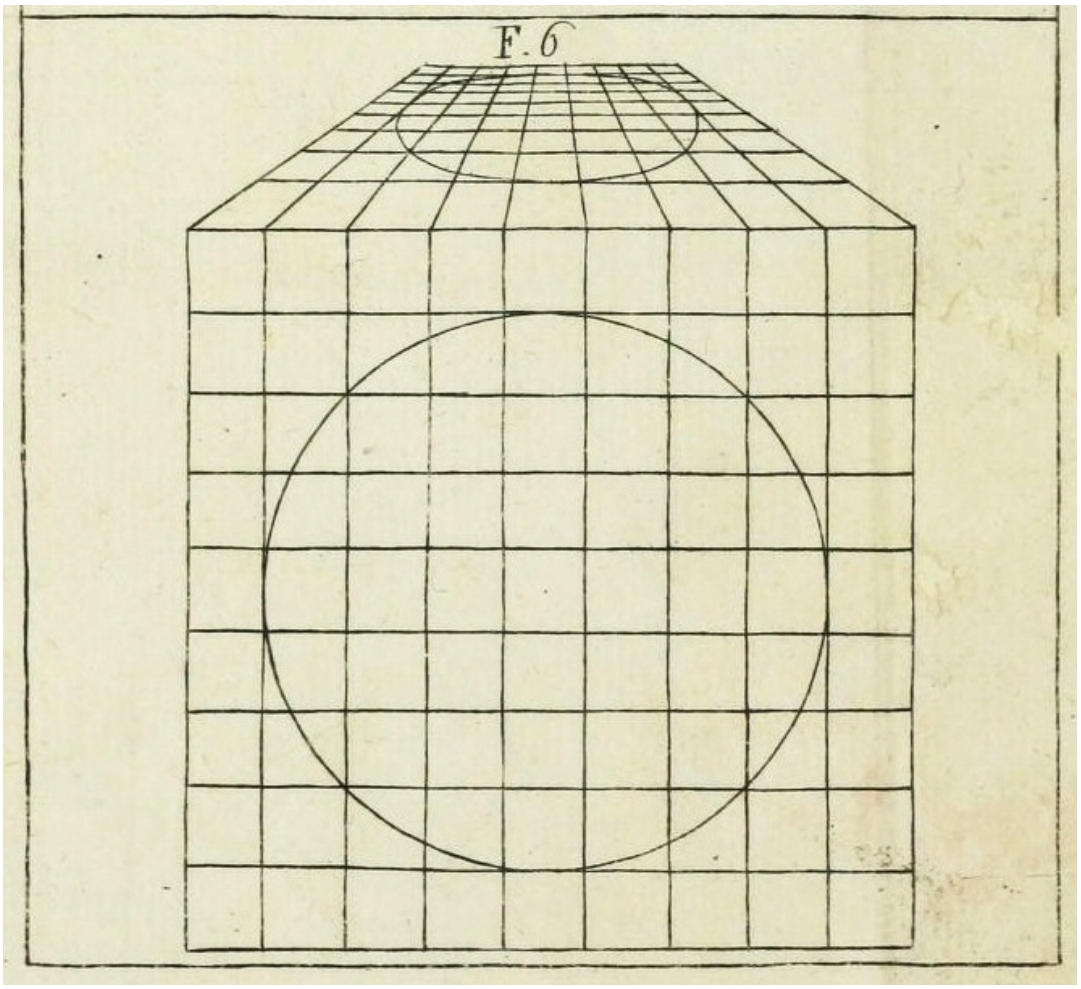
While most Medieval artists did not employ one-point perspective, at least one did. Therefore, while the Renaissance artist Brunelleschi did discover/re-discover this technique with an experiment in perspective, he was technically not the first to use this technique. Italian Medieval painter Ambrogio Lorenzetti used one-point perspective in his painting, Presentation at the Temple in 1342.

After this period, in the 1400s, during the early Renaissance, various artists started to draw paintings with more rationalism in their paintings. For example, artists during this time period had learned how to draw the human form in a more realistic or representational manner. Linear perspective helped them draw more realistic scenes as well.

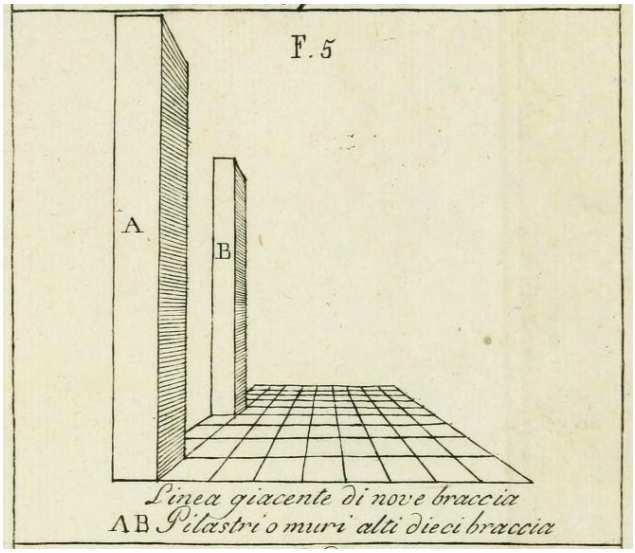
“The Delivery of the Keys to Saint Peter” (“Entrega de las llaves a San Pedro”) is a fresco painting by Italian Renaissance painter Pietro Perugino, painted in 1481-1482. It’s located in the Sistine Chapel, Rome, Italy. It employs one-point perspective. This is one of many examples of paintings that use one-point perspective from during or after the Renaissance.

A few decades later, Leon Battista Alberti published a book called On Painting which explained the system of linear perspective in detail. The method influenced artists such as Botticelli, Donatello, and Leonardo da Vinci, and eventually spread throughout Western Europe and is standard studio practice by artists today.

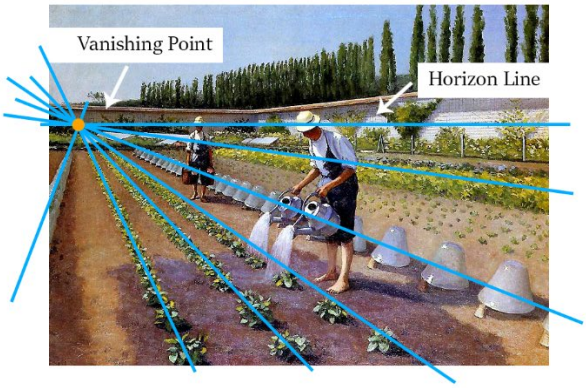
Two-point perspective is described in “Unterweisung der messing” ("Instruction of the measurement") by Albrecht Dürer, who in 1525 demonstrated the technique after reading works by Piero della Francesca (an Italian painter of the early Renaissance) and Luca Pacioli (an Italian mathematician who worked with Leonardo da Vinci).



From On Painting, this diagram shows a circle portrayed as an ellipse in perspective.



This diagram from On Painting shows pillars in perspective on a grid.



“Jardiniers (Gardeners)” by Gustave Caillebotte, an 1800s French Impressionist

This is another example of one-point perspective, produced centuries after the Renaissance.

“Rue de Paris, temps de pluie” (“Paris Street in Rainy Weather”) by Gustave Caillebotte, an 1800s French Impressionist

This example of a painting that has two-point perspective from the same artist. We review the differences between these techniques below and in the videos.

Perspective Terms

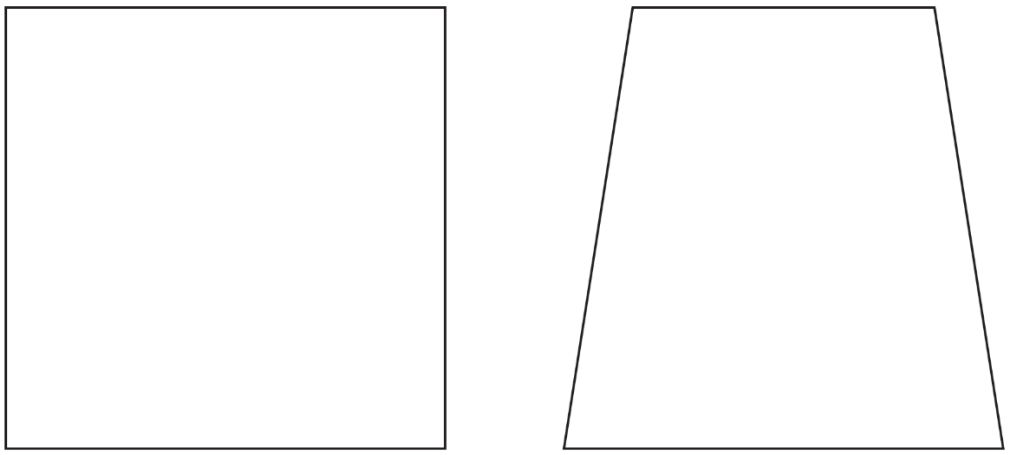
Now that we have went over a brief history of linear perspective, let's go over a few key terms.

Vanishing Point – This is a point on the image plane, either on the horizon line (in the case of one-point or two-point perspective), or above or below the horizon line (in the case of the third vanishing point in three-point perspective). In linear perspective, lines appear to meet or converge back at the horizon line at these vanishing points.

Horizon Line – Some drawings produced using linear perspective can have a horizon line that is visible (such as a horizon line at a sunset or sunrise painting where the horizon in the drawing works as the horizon line). But many times, the horizon line will be implied and only used for converging the lines back to the vanishing points as the elements are drawn. It is the line where the lines along the elements in the drawing converge back to in a perspective drawing.

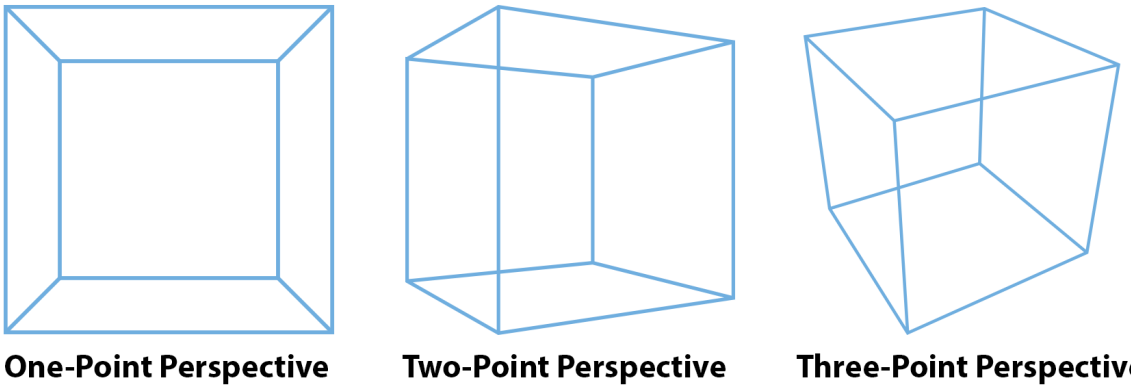
Orthogonals – Although I don't use this term, it's technically the term for the lines that drive back to the horizon line, which artists use to figure out the angle of elements in a perspective drawing. I suggest using a different color pencil if you want to make sure the diagonal lines are not confused with the edges of the elements such as buildings. I explain this in the videos.

Foreshortening – This refers to the optical illusion of distances or objects looking shorter than they are, because they are angled toward the viewer. For example, the side and bottom of a cube can look shorter than the top edge, if we are looking down on the cube from above. Foreshortening also refers to when a square resembles a trapezoid, because the edge farthest away looks shorter than it is. Similarly, a circle can look like an oval when viewed at a certain perspective.

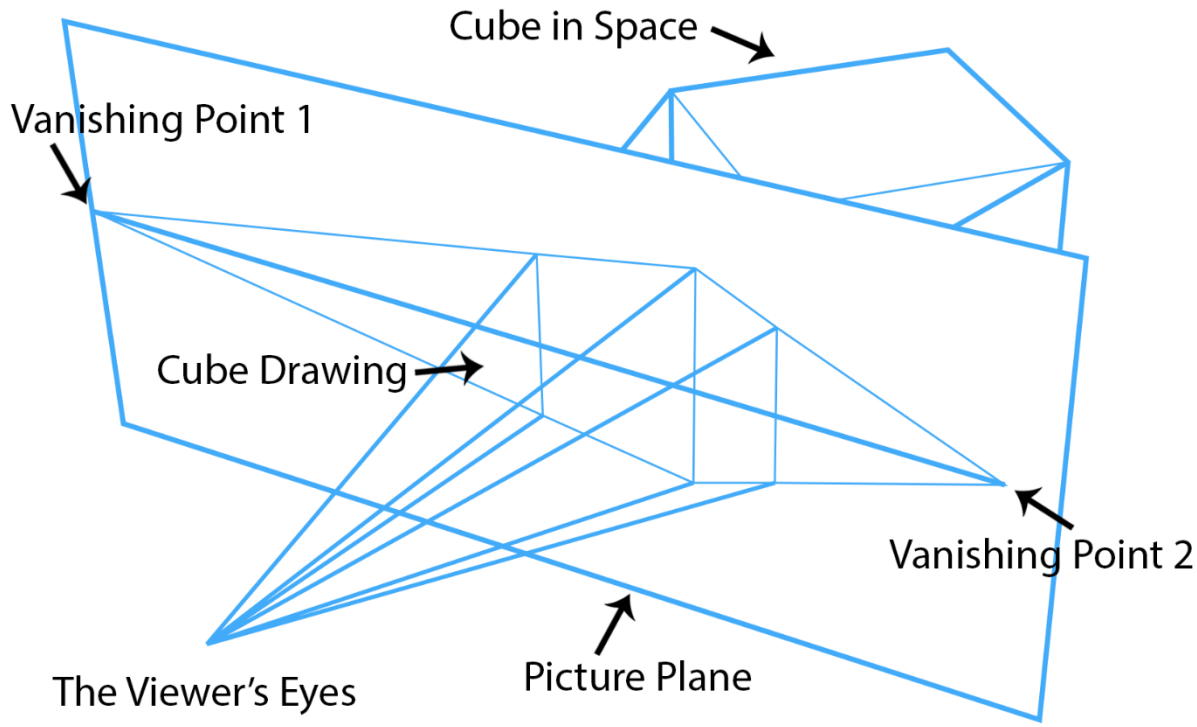


The square on the left is angled toward us so we are looking directly at the square. The "square" on the right looks like a trapezoid, but it is what a square would look like if we placed it on the floor and were looking down on it at an angle, or if it was tilted back or located higher up in relation to our viewpoint.

One-Point, Two-Point, and Three-Point Perspective



One-Point Perspective **Two-Point Perspective** **Three-Point Perspective**



The image above shows an example of the two-point perspective process, with a basic shape of a cube. Perspective drawing is based on the idea of a scene or subject being viewed from a specific point, through a picture plane. This imaginary rectangle or square is the plane of the drawing or painting. **Think of it as an artist looking at a scene or subject through a window and painting what he or she sees through the window, right onto the window.** The resulting painting on the window should look like what the artist saw through the window. For example, objects farther away should be smaller than the same objects when they are closer. Buildings should recede to the back and look like they are smaller on the side that is furthest away from the point of view, if the artist can see the side of the buildings from that point of view.

Drawing in one-point perspective involves using one vanishing point (hence the name) on the horizon line. We draw lines that converge back to the single vanishing point, in order to calculate the form and shape of elements in the drawing (this will be demonstrated in the videos, and so will two-point perspective and three-point perspective).

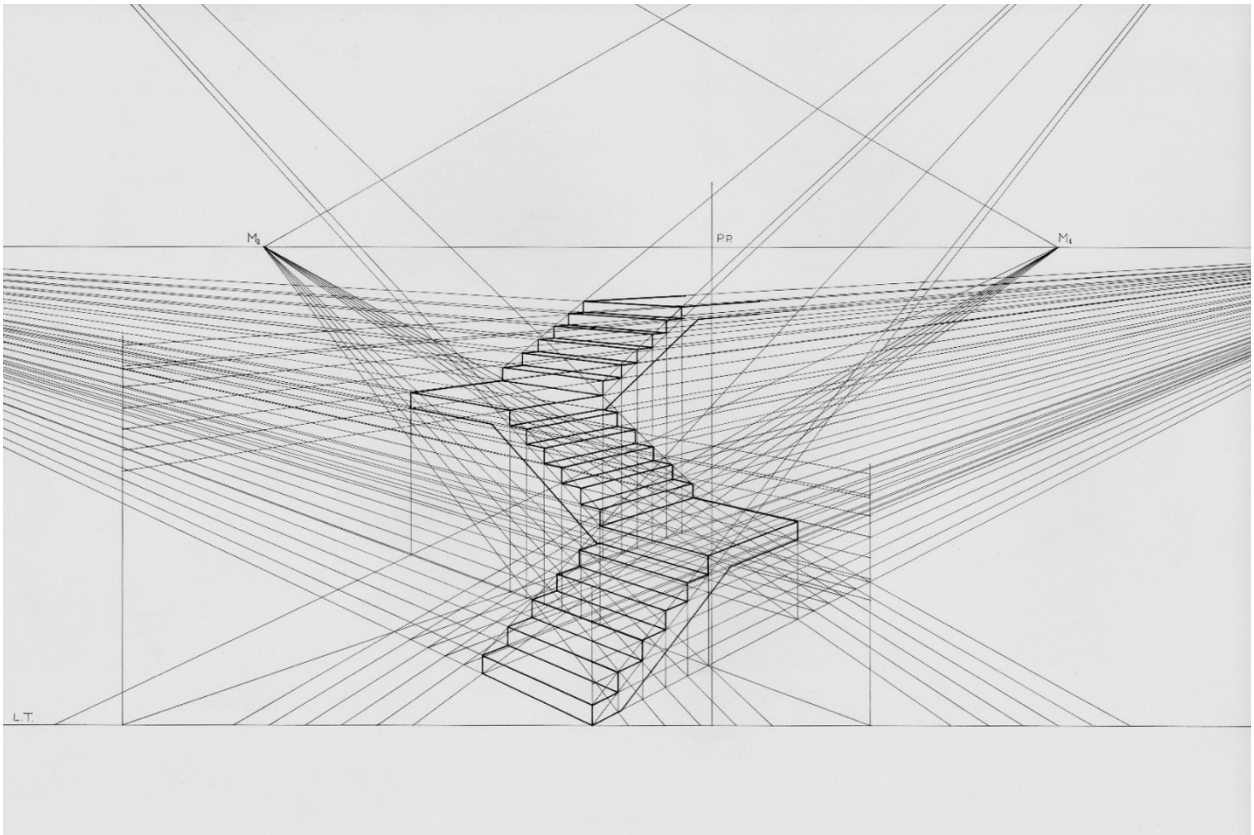
In two-point perspective, there are two vanishing points on the horizon line instead of one. If we are looking at the front of a building, one-point perspective would be helpful in drawing it from our viewpoint. If we are looking at the corner of a building, and two streets are meeting at an intersection where we are standing, then using two-point perspective would be helpful to portray this in a drawing. A cylinder resting on its side, parallel to our view, would look the same in one-point and two-point perspective, but most content would look different.

In three-point perspective, we use two vanishing points on the horizon line, but then we add a third point either above or below the horizon line. This is typically used for drawing cityscapes or buildings from above or below. The third vanishing points helps show how the walls recede back. When drawing an object or scene from above, the third vanishing point would be below the ground of this cityscape example. When drawing an object or scene from below (looking up at a building or buildings), the third vanishing point would be way up high above the buildings.

Perspective Examples

The elements in this photo of railroad tracks help demonstrate one-point perspective. We could open this photo in Photoshop or Illustrator and draw lines along the tracks and figure out where the one vanishing point is. The lines would converge back at the vanishing point. Where they meet would help us figure out where the horizon line is.

This photo of a hallway at the Uffizi Gallery in Florence, Italy, is another example that shows one-point perspective.



This is a relatively complicated example of two-point perspective by Luciano Testoni, featuring a staircase with three ramps.

Note: Drawings can have multiple vanishing points or sets of vanishing points. It depends on how we rotate objects in the scene in relation to the picture plane. For a basic example, we could have a two-point perspective drawing that has four cubes in it, and each cube is drawn with a different set of vanishing points. The example drawing would have eight vanishing points. Another basic example is if we used five vanishing points using one-point perspective to draw five different objects (e.g., cubes) that are rotated differently in a scene.

Each object or group of objects would have its own assigned vanishing point (in one-point) or set of vanishing points (in two-point). We do suggest you start out using only one vanishing point in one-point perspective, or two points in two-points, for all objects in the scene, to get used to this drawing technique first.

Hopefully this handout was helpful. Review the videos and follow along in order to put these drawing techniques into practice. We do not want to get too deep into theory, especially with mathematical perspective, because this is a practical class focused on applying these concepts. However, here are some helpful sources for optional further reading:

- The Geometry of an Art: The History of the Mathematical Theory of Perspective from Alberti to Monge, by Kirsti Andersen
- The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat, by Martin Kemp
- Manifold Mirrors: The Crossing Paths of the Arts and Mathematics, by O. Nicholas Books
- Renaissance and Renascences in Western Art, by Erwin Panofsky and Lena I. Gedin
- Lives of the Artists, by Giorgio Vasari
- The Origin of Perspective, by Hubert Damisch
- Brunelleschi in Perspective, by Isabelle Hyman
- Perspective: From Basic to Creative, by Robert W. Gill